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Rocky Flats Environmental Technology Site

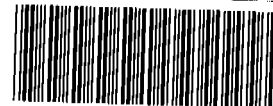
P.O. Box 464

Golden, Colorado 80402-0464

Phone: (303) 966-2678

Fax: (303) 966-8244

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April 12, 1996

96-RM-WM-00074-KH

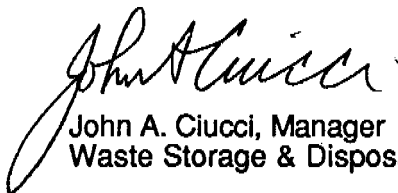
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P.O. Box 464  
Golden, Colorado 80402-0464

COMPLETION OF MILESTONE 20061, DEVELOP A CONSOLIDATED SAMPLING AND ANALYSIS PLAN, WORK PACKAGE 13303 - JAC-064-96

Action: None

RMRS completed the draft sampling and analysis plan for radioactive contaminated oils in March 1996. This sampling and analysis plan completes milestone 20061 in Work Package 13303. Attached is a copy of the draft procedure 1-10000-EWQA-1.6.1, Rev 0, *Sampling and Analysis Plan for Fluidized Bed Incinerator Oil, Tank 1-102/T-103*. Once a disposal vendor is selected, the vendor will have to concur that the sampling and analysis plan meets their specific waste acceptance criteria. This same sampling and analysis plan will be used to ship the oils in 774 tanks and the containerized waste oil in RCRA Units 1 and 10.

If you have questions or need additional information, contact Joe Molter at extension 2808.

  
John A. Ciucci, Manager  
Waste Storage & Disposal

EJP:lmg

Attachment:  
As Stated

cc: w/o Atch

R. J. Molter - RMRS  
E. J. Poling - RMRS  
A. P. Power - RMRS  
RMRS Records - Bldg. 080



ADMIN RECCRD

1/25  
IA-A-000703

Rocky Flats  
Environmental Technology Site

NOT SAFETY RELATED  
CATEGORY 1

Manual:  
Section:  
Page:  
Effective Date:  
Organization:

1-10000-EWQA-1.6.1

Rev. 1

1 of 24

TBD

RMRS, Waste Management Operations

**SAMPLING AND ANALYSIS PLAN  
FOR  
FLUIDIZED BED INCINERATOR OIL  
TANK T-102/T-103**

March 20, 1996

Prepared for:

**Rocky Flats Environmental Technology Site  
Golden, Colorado 80402-0464**

Prepared by:

**Rocky Mountain Remediation Services**

REVIEWED FOR CLASSIFICATION/UCNI

BY \_\_\_\_\_

DATE \_\_\_\_\_

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Rocky Flats  
Environmental Technology Site

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1-10000-EWQA-1.6.1  
Rev. 1  
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TBD  
RMRS, Waste Management Operations

## CONCURENCE SIGNATURES

The following individuals have reviewed this plan and concur with its contents.

RMRS Waste Inventory and Documentation	Date
RMRS Operations Support	Date
Building 774 Operations	Date
Analytical Projects Office	Date

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## ABBREVIATIONS AND ACRONYMS

APO	Analytical Projects Office
ASO	Analytical Services Organization
ASTM	American Society for Testing and Materials
CFR	Code of Federal Regulations
CHWR	Colorado Hazardous Waste Regulations
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
DSSI	Diversified Scientific Services, Inc.
EG&G	EG&G Rocky Flats, Inc.
EPA	U.S. Environmental Protection Agency
FBI	Fluidized Bed Incinerator
FSO	Field Sampling Office
IWCP	Integrated Work Control Program
LDR	Land Disposal Restrictions
LLM	low-level mixed
LMES	Lockheed Martin Energy Systems
LWC	LDR Waste Compliance
PCB	polychlorinated biphenyl
ppm	parts per million
QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act
RMRS	Rocky Mountain Remediation Services
Site	Rocky Flats Environmental Technology Site
SAP	Sampling and Analysis Plan
SMO	Sample Management Office
SVOC	semivolatile organic compound
TCLP	Toxicity Characteristic Leaching Procedure
TSCA	Toxic Substances Control Act
VOC	volatile organic compound
WIC	Waste Identification and Characterization
WSRIC	Waste Stream and Residue Identification and Characterization
WSRIC PD	WSRIC Program Description

## 1.0 PROJECT DESCRIPTION

This plan describes sampling and analysis of the Fluidized Bed Incinerator (FBI) oil waste in Tanks T-102 and T103 generated and stored at the U.S. Department of Energy (DOE) Rocky Flats Environmental Technology Site (Site). The purposes of the plan are:

- To direct the production of sound, defensible waste characterization data, and
- To obtain information for the treatment of the waste.

FBI oil waste was generated throughout the Site. The oil is called "FBI oil" because, historically, it was destined for incineration in the FBI in Building 776. The FBI in Building 776 never became fully operational and, as a result, the oil which was to be feed material accumulated and is now in storage. The contents of Tank T-102 are currently characterized as a Resource Conservation and Recovery Act (RCRA)-hazardous waste, with low-level radioactive contamination (low-level mixed [LLM] waste). This characterization is based upon existing analytical data and knowledge that spent solvents were put into Tank T-102. In addition, the oil is suspected to be regulated under the Toxic Substance Control Act (TSCA) because of polychlorinated biphenyl (PCB) contamination. Sampling of the FBI oil is necessary to ensure the proper identification, handling, management, and treatment of the waste with regard to applicable regulations and criteria.

This Sampling and Analysis Plan (SAP) is an integral part of the *WSRIC Program Description* (WSRIC PD) (EG&G 1993). The WSRIC PD defines the quality assurance goals and protocol for waste and residue characterization activities at the Site. In addition, the WSRIC PD identifies the responsible organizations, describes program operations, and delineates the associated procedures and policies. This SAP addresses the specific elements of waste sampling not addressed in or deviating from the WSRIC PD, including defining the waste to be sampled and project objectives, describing sampling and analysis strategies, and identifying unique sampling considerations. Sampling and onsite analysis activities described in this SAP will be conducted in accordance with the WSRIC PD. Compliance of analysis activities with the Lockheed Martin Energy Systems TSCA Incinerator W.A.C. will be the responsibility of the LMES Site Analytical Coordinator.

### 1.1 Description of the Site

Rocky Flats is located in northern Jefferson County, Colorado, about 16 miles northwest of Denver, and is a government-owned, contractor-operated facility that is part of the nationwide nuclear weapons production complex. More than 270 buildings and structures, of which about 75 are trailers, are located at the facility. Major manufacturing, chemical processing, plutonium recovery, and waste treatment facilities occupy about 1.6 million square feet of this space. The remaining floor space is occupied by laboratories; administrative offices; warehouses; and utility, security, storage, and construction contractor facilities.

The primary mission of the Site was production of components for nuclear weapons. Plutonium, uranium, beryllium, and stainless-steel parts were fabricated and shipped off-site for final assembly. Additional activities included chemical processing to recover

plutonium from scrap material, metallurgical research and development, machining, assembling, nondestructive testing, coating, engineering, chemistry, and physics.

At present, waste handling operations at the Site include storage, transportation, treatment, and packaging of waste materials. Wastes managed at the facility include nonhazardous, hazardous, radioactive, and mixed radioactive.

## **1.2 Identification of Types of Waste to be Evaluated**

FBI oils were generated throughout the Site from the maintenance of radioactively contaminated equipment, solvent degreasing operations, and the changing of hydraulic pump oil. Historically, waste oil was accumulated for incineration by the FBI in Building 776. The FBI has never been in full operation and is not presently in operation. The oil has been collected in two large storage tanks (T-102 and T-103) and in 55-gallon drums.

This SAP addresses the oil in Tanks T-102 and T-103. Both tanks are above-ground storage tanks located inside Building 774. The tanks are approximately 22 feet high and 9 feet in diameter, and have a capacity of about 10,000 gallons.

Based on process knowledge, there is a high probability of a sludge layer in the bottom of the tank(s) as a result of solids settling out of the oil. The sludge will be characterized separately from the oil since, due to physical sampling constraints, a representative sample of the sludge cannot be collected at this time. However, one sample of the sludge from each tank will be collected for informational purposes.



### 1.3 Sampling and Analysis Plan Objectives

The characterization objectives for the FBI oil in Tanks T-102 and T-103 are described within this section. Data generated by this sampling effort will be evaluated to determine if these objectives have been achieved.

The objectives of this SAP are to:

- Produce sound, defensible waste characterization data for the oil under RCRA and TSCA regulations;
- Obtain information necessary for the treatment of the oil;
- Generate data to meet the requirements of the U.S. Department of Transportation (DOT) and the *Rocky Flats Transportation Safety Manuals* for possible shipment of the oil to an off-site treatment facility; and,
- Obtain information on the sludge in the tank.

Characterization requirements based on the SAP objectives are summarized in Table 1-1.

**Table 1-1 Characterization Requirements**

Characterization Parameter	Requirement
Characteristic of Toxicity (D004-D011)	40 CFR 261.24
Hazardous wastes from non-specific sources (F-listed wastes) <sup>1</sup>	40 CFR 261.31
PCBs <sup>1</sup>	40 CFR 761.3
Transportable for Interstate Commerce	49 CFR 173
Within Transportation Radioactive Limits	49 CFR 173 Subpart I
Radiological components <sup>1</sup>	Treatment
Fingerprint <sup>1</sup>	Treatment
Heat Content (BTU)	Treatment
Ash content	Treatment
Water content	Treatment
Chlorine	Treatment
Fluorine	Treatment
Non-RCRA-regulated metals <sup>1</sup>	Treatment

Notes: 1. See Section 5.0 for the specific analytes.

Acronyms: BTU British Thermal Unit  
CFR Code of Federal Regulations  
PCBs Polychlorinated Biphenyls  
RCRA Resource Conservation and Recovery Act

#### **1.4 Use of Process Knowledge and Analytical Data**

The current characterization of FBI oil is based on the assessment of the waste made during the Backlog Waste Reassessment program conducted by the Waste Identification and Characterization (WIC) group at Rocky Flats (EG&G 1994). Based on this reassessment, FBI oil is a RCRA-hazardous waste that does not meet the Land Disposal Restrictions (LDR) treatment standards as defined by 40 CFR Part 268. The Environmental Protection Agency (EPA) Hazardous Waste Numbers applicable to the oil in Tanks T-102 and T-103 are D008, F001, F002, F003, and F005. The WIC reassessment is based on process knowledge and historical analytical data for the oil in Tank T-103. Even though analytical data are not available for the oil in Tank T-102, the chemical constituents of the oil in Tanks T-102 and T-103 are thought to be very similar based on process knowledge. There is no analytical data for the sludge in either tank.

Analytical data from sampling done in 1994 on the oil in Tank T-103 indicate that the oil exhibits the characteristic of toxicity for lead (D008) only. Other RCRA-hazardous metals analyzed were below their respective regulatory threshold level. Mercury analysis was done on the composite sample only. An investigative, non-validated analysis indicates PCBs in excess of 50 parts per million (ppm). Consequently, the oil in Tank T-103 is presently being managed under TSCA.

#### **1.5 Use of Results**

The data generated from the execution of this plan will be reviewed to determine if the objectives outlined in Section 1.3 have been satisfied.

Results from sampling and analysis of the oil in Tanks T-102 and T-103 will be used for characterization under RCRA and TSCA regulations. The results will also be used to support development of waste treatment technologies, and to gain information on the sludge in the tank.

The analytical results will be used to evaluate whether or not the oil can be shipped to an off-site treatment facility, or if on-site treatment is required. If the oil will be shipped off-site for treatment, the results from the SAP will also be used to determine if DOT requirements and the selected treatment facility waste acceptance criteria are met. At this time, the sludge is not under consideration for shipment offsite for the purpose of treatment.

## **2.0 SAMPLING AND ANALYSIS ORGANIZATION AND RESPONSIBILITIES**

The organizations that will be involved in this sampling effort and their responsibilities are presented below.

### **2.1 Waste Management Operations**

Rocky Flats Waste Management Operations evaluates waste forms at the Site for appropriate characterization, and identifies waste treatment methods, disposal methods, or both. Operations Support is the group within Waste Management Operations responsible for coordinating or preparing necessary procedures and obtaining the appropriate reviews and approvals. Waste Inventory and Documentation (WID) is also a group within Waste Management Operations and is responsible for data review, management, and writing the characterization advisory.

### **2.2 Analytical Laboratories**

The on-site analytical laboratories will be responsible for performing some of the analyses. Contracted analytical laboratories off-site will be used for analysis of verification samples representing Tanks T-102 and T-103.

### **2.3 Building 774 Operations**

Building 774 Operations will assist WID, Operations Support, the Analytical Projects Office (APO), and the on-site analytical laboratories to ensure the sampling team has access at the appropriate times to collect the samples. Building 774 Operations will also be responsible for providing the necessary resources to access Tanks T-102 and T-103 to collect the samples.

### **2.4 Analytical Projects Office**

The APO collects and prepares the samples for on-site transfer or off-site shipment to the laboratory. The APO is also responsible for the tracking of samples. The APO generates sample requests and sample labels, and receives the data packages from the laboratory.

### **2.5 Environmental Technologies**

ET is responsible for the development of a tool for sampling the sludge in Tanks T-102 and T-103, and will insure that the tool is functional and satisfactory for sampling the sludge.

### 3.0 SITE SELECTION AND SAMPLING PROCEDURES

Before sampling proceeds, industrial hygiene and safety requirements addressed in the IWCP package must be met. Sample collection, preparation, and packaging shall be performed in accordance with the requirements of this SAP, and the Rocky Flats waste sampling procedure L-3306, *Waste Characterization Sampling Procedure Inside the Protected Area* (EG&G 1991).

#### 3.1 Sampling Approach

In an effort to collect a representative sample, four samples from randomly selected depths will be taken of each tank. Additionally, one duplicate sample will be taken at a designated depth. A simple random sampling strategy was implemented to select depths. A computerized random number generator was used to identify the specific depths to be sampled. Four samples and the one duplicate from each of the Tanks T-102 and T-103 will account for the five one-liter containers to be sent to the treatment facility for verification sampling. Four samples at the designated depths will be taken from Tank T-102 for on-site analysis. One sample of the sludge layer from each tank will also be taken.

The randomly selected depths for each tank are at 6 feet, 9 feet, 15 feet, and 18 feet. A duplicate sample will be taken at 18 feet.

Tanks T-102 and T-103 are located in Room 220 of Building 774. The tanks are constructed of 3/16" carbon steel and is 9 feet in diameter and 22.4 feet high. The tanks are symmetrical and the bottom is not significantly rounded or cone shaped. Sampling will be accomplished using a 3-foot teflon bailer for sampling the oil and a 6-foot sludge sampler for taking a sample from the surface of the sludge. The sampling procedures describe basic procedures concerning the use of a bailer. The sludge sampling tool is a square coring tool with a hammer device that will drive the tool into the sludge.

On the top of Tank T-102, directly below the walkway between the two tanks, there is a process waste fill line for T-102. This line will be breached temporarily to provide an opening of approximately 2 inches to collect the samples.

On the top of Tank T-103, before the walkway, there is a blanked port that was previously used for the sampling of Tank T-103. This blanked port will be temporarily breached to provide an opening of approximately 4 inches to collect the samples.

The bailer cord shall be marked as needed to gauge the depth of the sample, giving the sampler the ability to collect samples at a specified depth in the tank. A square coring tool and hammer device will be used to collect a sample from the surface of the sludge. Sample collection containers will be one liter amber colored glass for analytical aliquots to be sent offsite to the treatment facility. Sample containers for on-site analysis will be glass and have sufficient volume for all analytical aliquots. The APO shall generate a sufficient number of sample requests and container labels prior to sampling. The duplicate sample will have a "D" designator appended to the sample I.D.

The tank will be sampled by the APO Sample Team using the following steps:

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**NOTE:** The sample material collected from each identified depth of Tanks T-102 and T-103 will be equally divided among the five containers taken for verification analysis by the treatment facility. Duplicate aliquots of sample material will be taken at the 18 foot depth. Additional sample aliquots at each identified depth will be taken of Tank T-102 for fingerprint analysis, PCB analysis, and radiological components for analysis by RFETS analytical laboratory.

1. Lower the bailer into the oil.
2. Raise the bailer to the surface and empty equal portions of the oil into each of the collection containers. Record the depth from which the sample was collected on the sampling worksheet. Also record the physical appearance of the liquid and any other observations made in the sampling logbook.
3. Lower the bailer to the depth of the next identified sample point.
4. Repeat Steps 2 and 3 until the required sample volume is achieved.  
**Note:** Duplicate aliquots of sample material will be taken at the 18 foot depth.
5. Send the radioactivity screening sample aliquots to Building 559 laboratory for radioactivity screening.
6. Prepare samples for transfer to the designated analytical laboratories for analysis. **Note:** Samples are to be stored with refrigeration at +/- 4° C while awaiting radioactivity screening results.
7. Lower the sludge sampler into the tank until it reaches the sludge, then collect a sample of the sludge. Record the depth on the sampling worksheet at which the sludge was encountered.  
**Note:** An equipment blank of the sludge sampling device shall be collected prior to sampling.
8. Raise the sludge sampler to the surface, and empty the sludge into the collection container. Record the physical appearance of the sludge and any other observations made in the sampling logbook and field worksheets.
9. Collect a subsample from one of the sludge collection containers, and send the samples to the Building 559 laboratory for radioactivity screening analysis.
10. Prepare sludge samples for transfer to the RFETS analytical laboratory.  
**Note:** Samples are to be stored with refrigeration at +/- 4° C.

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### 3.2 Number of Samples

To obtain as representative a sample as possible, at least four random sample points of the oil in each of Tanks T-102 and T-103 shall be collected. The number of samples needed to accomplish this is based upon statistical analysis required to achieve a ninety percent confidence interval (EG&G, 1994). Additionally, one duplicate sample shall be collected at one of the depths. A total volume of five one liter containers per tank is required for analysis at an offsite laboratory. Additionally, one sample of the sludge shall be collected from each tank for analysis at an RFETS on-site laboratory.

### 3.3 Sample Volume

The volume of the bailer is 1050 milliliters. A sufficient number of bailer samples shall be collected to provide enough sample volume for performing all the required analyses. Five one liter containers have been requested for verification sampling.

### 3.4 Sampling Equipment

Equipment required for this sampling effort includes the following:

- Teflon bailer (1.5 inch diameter and 36 inch length)
- Square coring tool with hammer device (1.5 inch square tube, 6 feet in length)
- Glass marked containers
- Personal protective equipment (the job-specific IWCP indicates the level needed)

Additional equipment as specified in the sampling procedures or as determined by the samplers. Specific equipment used for taking the samples will be documented in the samplers' log book.

### 3.5 Sample Handling

Sample handling addresses procedures for handling samples from the time they are collected in the field until they arrive at the laboratory for testing. To ensure sample integrity, specifications for sample holding times, preservation temperatures, container types, and sample volumes have been established.

Sample holding time requirements have been established to limit loss or chemical change of organic and inorganic analytes. Sample holding times are specified in the WSRIC PD. The clock for assessing whether holding time requirements have been met starts when the sample is collected, not when the sample is received by the analytical laboratory. Container type and sample preservation are specified in sampling procedures L-3306. Sample holding times, preservation, and container types listed in EPA SW-846 shall be followed. Deviations to EPA SW-846 protocol will be in the sampling procedures (EPA 1994).

Sample volumes are laboratory dependent and shall be specified at the time of the request. Return of excess samples must be coordinated with Building 774 Operations personnel.

### 3.6 Field Quality Control

The field sampling Quality assurance and quality control (QA/QC) program will include routine maintenance of equipment (documented in an equipment log), quality control samples, and Chain-of-Custody (EG&G, 1994).

Field quality assurance and quality control (QA/QC) samples of the oil matrix shall be analyzed by the Lockheed Martin Energy Systems (LMES) Analytical Services Organization (ASO) to provide a quality control check. Field quality assurance and quality control (QA/QC) samples of the sludge matrix will be analyzed by the RFETS onsite laboratory. The following QA/QC samples shall be collected:

- Trip Blanks (1 for each day of sampling)
- Field Blanks
- Field Duplicate (1)
- Equipment Blank (sludge sampler only)

Trip Blanks consist of volatile organic compound vials filled with ASTM-Type II water. Trip blanks are transported in the same manner as other sampling containers to the sampling sites and returned unopened to the laboratory for analysis. One trip blank will be included each day when sampling VOC's.

Field blanks consist of a full set of sample bottles filled with ASTM-Type II water, preserved with appropriate reagents and taken to the field. They are to be opened at a specific sampling location and exposed to the sampling environment during the sampling event. The sample bottles will then be capped, sent to the laboratory, and analyzed to determine reagent and environmental airborne contamination. At least one field blank will be collected with each batch of samples or when the sample matrix changes.

Field duplicates are independent samples collected as close as possible to the same point in time and space. Duplicates are two separate samples taken from the same source, placed in separate containers, and analyzed independently. Duplicates are to be labeled with a "D" designator appended to the sample ID.

Equipment Blanks, collected from the sampling equipment rinsate, will be collected only if reusable sampling equipment is used. Equipment Blanks will consist of the final rinse water (ASTM- Type II) from equipment cleaning that has been collected during sampling equipment decontamination. The sample will be analyzed for the same analytes as the samples collected that day.

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### 3.7 Equipment Decontamination

All sampling equipment shall be verified to be clean at the start of sampling. Following sampling, the sludge sampling device will be decontaminated, and disposable equipment will be discarded. Equipment decontamination and disposal will be performed in accordance with the WSRIC PD.

### 4.0 DOCUMENTATION AND SAMPLE CUSTODY

This section describes documentation and sample custody procedures that will be used to ensure the data are legally defensible. Labels and seals identify samples and verify the sample has not been opened prior to analysis. Logbooks and sampling worksheets document sampling events so the event may be reconstructed at a later date, should the need arise. Logbooks contain other pertinent information such as the physical appearance of the sample. Specific label, seal, and logbook protocols presented in the WSRIC PD and in the sampling procedures will be followed during all sampling and analysis activities.

Chain-of-custody records demonstrating sample integrity and appropriate sample management will be maintained from collection through disposal. Chain-of-custody forms are initially completed and signed during sample collection and travel with the samples to receiving personnel at the laboratory. Chain-of-custody records and procedures are discussed in the WSRIC PD and laboratory procedure L-3004, *Chain of Custody*.

Sample Request Forms will be generated for each sample collected. The Sample Request Form will be filled out completely and will include information such as:

- Requestor and waste generator
- Location of sample material (Building, Room, Tank Number, Depth in tank at which sample was collected, and layer of sample)
- Radioactivity concerns
- Directions and comments to the sampling team
- Analyses requested

Unique sample identification numbers assigned to each sample container will also be printed on the Sample Request Forms.

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## 5.0 ANALYSIS OF WASTE SAMPLES

The Rocky Flats analytical laboratories will analyze both the oil and the sludge samples collected. The oil will have Fingerprint, PCB, and radiological analyses performed. Each sample of the sludge shall be analyzed for radiological components, metals, VOCs, SVOCs, and PCBs, as well as other miscellaneous parameters that will be used for the evaluation of treatment of the waste. On-site laboratory operations and requirements are described in the WSRIC PD. LMES off-site laboratories will be contracted to augment the on-site analytical capabilities for verification analysis. Each sample shall be analyzed for radiological components, metals, VOCs, SVOCs, and PCBs, as well as other miscellaneous parameters that will be used for the evaluation of treatment of the waste, as determined by the treatment facility. Sampling requirements are given in Table 5-1.

**Table 5-1 Fluidized Bed Incinerator Oil Waste Sampling Requirements**

ANALYSIS	NUMBER OF SAMPLES REQUIRED	
	Oil <sup>1</sup>	Sludge
Alpha/Beta Screen	4	1
Gamma Spectroscopy	4	1
Gross alpha/beta	4	1
Isotopic <sup>2</sup>	4	1
Metals using totals analysis <sup>3</sup>	4	1
VOCs using totals analysis <sup>3</sup>	4	1
SVOCs using totals analysis <sup>3</sup>	4	1
PCBs using totals analysis <sup>3</sup>	4	1
Fingerprint analyses <sup>3</sup>	4	1
Heat Content	4	1
Ash Content	4	1
Water Content	4	1
Chlorine	4	1
Fluorine	4	1

- Notes:
1. 4 oil samples will be collected at identified depths of the oil. 1 duplicate will also be collected.
  2. See Section 5.1 for specific isotopes.
  3. See Sections 5.2 through 5.6 for specific analytes.

Acronyms:

PCBs Polychlorinated biphenyls  
SVOCs Semivolatile organic compounds  
VOCs Volatile organic compounds

## 5.1 Radiological Components

Alpha and beta radioactivity screening, gamma spectroscopy, and isotopic analyses shall be performed on each sample of sludge to obtain information for the treatment of the waste. Gross a/B analyses shall be performed on all samples so that a determination can be made of whether the waste meets the DOT definition of radioactive, and to assist in determining packaging, marking, labeling, and transport requirements in accordance with 49 CFR Parts 100-180. These analyses will be conducted by a RFETS laboratory. Table 5-2 lists the required radiochemistry analyses that may be performed. Table 5-2a lists the radiochemistry analyses that will be performed by the Lockheed Martin Energy Systems Analytical Services Organization laboratory to meet Waste Acceptance Criteria.

Table 5-2 Radiological Parameters

Parameter	
Alpha/Beta Screen	
Gamma Spectroscopy	
Gross alpha/beta	
Isotopic:	Americium-241
	Cesium-137
	Neptunium-237
	Protactinium-234
	Plutonium-238
	Plutonium-239
	Plutonium-240
	Plutonium-241
	Plutonium-242
	Technetium-99
	Thorium-228
	Thorium-230
	Thorium-232
	Thorium-234
	Uranium-230
	Uranium-232
	Uranium-233
	Uranium-234
	Uranium-235
	Uranium-236
	Uranium-238

**Table 5-2a Radiological Parameters-LMES-ASO**

Parameter
Gamma Spectroscopy Scan (Cs-134, Cs-137, Co-57, Co-60, Pa-234, Th-234, Kr-85, U-gamma isotopes)
Gross Alpha/Beta
Neptunium-237
Plutonium-238
Plutonium-239
Technetium-99
Thorium-228
Thorium-230
Thorium-232
Total Activity
Total Uranium and Percent Uranium-235
Total Uranium and isotopes (U-234, U-235, U-236, U-238) Alpha Activity

**Note: Total Uranium and Percent Uranium-235 requires duplicate analysis.**

## **5.2 Metals**

The oil in Tank T-102 and T-103 shall be analyzed for select metals, determined by the treatment facility during verification analysis. Verification analysis will be performed by the LMES ASO laboratory. This analysis will be used to determine if the waste exhibits the characteristic of toxicity as defined in 40 CFR Part 261.24. The sludge will be analyzed for the required metal analytes as listed in Table 5-3, by an RFETS laboratory.

**Table 5-3 Metal Analytes**

Constituents	C A S Number	E P A Hazardous W a s t e Number	Base Method <sup>2</sup>	L D R Treatment Standard-Nonwastewater CCWE (mg/l)
Aluminum	7429-90-5	NR	EPA - 3010/6010	N/A
Antimony	7440-36-0	NR	EPA - 3010/6010	N/A
Arsenic	7440-38-2	D004	EPA - 7060/7061	5.0
Barium	7440-39-3	D005	EPA - 3010/6010	100
Beryllium	7440-41-7	NR	EPA - 3010/6010	N/A
Cadmium	7440-43-9	D006	EPA - 3010/6010	1.0
Copper	7440-50-8	NR	EPA - 3010/6010	N/A
Iron	7439-89-6	NR	EPA - 3010/6010	N/A
Chromium (Total)	7440-47-32	D007	EPA - 3010/6010	5.0
Lead	7439-92-1	D008	EPA - 3010/6010	5.0
Lithium	7439-93-2	NR	EPA - 3010/6010	N/A
Magnesium	7439-95-4	NR	EPA - 3010/6010	N/A
Manganese	7439-96-5	NR	EPA - 3010/6010	N/A
Mercury	7439-97-6	D009	EPA - 7470/7471	0.2 <sup>1</sup>
Nickel	7440-02-0	NR	EPA - 3010/6010	N/A
Phosphorus	7723-14-0	NR	EPA - 3010/6010	N/A
Selenium	7782-49-2	D010	EPA - 7740/7741	5.7
Silver	7440-22-4	D011	EPA - 3010/6010	5.0
Sodium	7440-23-5	NR	EPA - 3010/6010	N/A
Sulphur	7704-34-9	NR	EPA - 3010/6010	N/A
Thallium	7440-28-0	NR	EPA - 7841	N/A
Titanium	7440-32-6	NR	EPA - 3010/6010	N/A
Zinc	7440-66-6	NR	EPA - 3010/6010	N/A

Notes:

1. The concentration-based treatment standard applies to wastes that contain less than 260 mg/kg of mercury. If the total mercury is greater than or equal to 260 mg/kg then a technology-based treatment standard must be used to treat the waste.

2. Testing Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, unless otherwise noted.

Acronyms: CAS Chemical Abstract Service  
CCWE constituent concentration in waste extract  
EPA Environmental Protection Agency  
LDR Land Disposal Restrictions  
mg/l milligrams per liter  
N/A Not applicable  
NR Not regulated

### 5.3 Volatile Organic Compounds

The oil in Tanks T-102 and T-103 shall be analyzed for select VOCs, as determined by the treatment facility. Analysis of the oil will be performed by the LMES ASO laboratory. The sludge in Tanks T-102 and T-103 shall be analyzed for VOCs to quantify the halogenated and nonhalogenated solvents in 40 CFR Part 261.31 for which the waste is listed (EG&G 1994). The sludge will be analyzed by a RFETS laboratory. The required VOC analytes are listed in Table 5-4. Additional analytes or tentatively-identified compounds measured during analysis will also be reported and used as applicable to verify that the waste does not exhibit the characteristic of toxicity, and to gain information for the treatment of the waste.

Table 5-4 Volatile Organic Compounds

Constituents	C A S Number	E P A Hazardous Waste Number	Base Method <sup>2</sup>	LDR Treatment Standard-Nonwastewater CCW (mg/kg)
Carbon tetrachloride	56-23-5	F001	EPA - 8240/8260	6.0
Ethyl benzene	100-41-4	F003	EPA - 8240/8260	10.0
Toluene	108-88-3	F005	EPA - 8240/8260	10.0
1,1,1-Trichloroethane	71-55-6	F001, F002	EPA - 8240/8260	6.0
Trichloroethylene (trichloroethene)	79-01-6	F001, F002	EPA - 8240/8260	6.0
1, 1, 2-T richloro-1, 2, 2-trifluoroethane	76-13-1	F001, F002	EPA - 8240/8260	30

Notes:

1. Testing Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, unless otherwise noted.

Acronyms: CAS Chemical Abstract Service  
CCW constituent concentrations in waste  
EPA Environmental Protection Agency  
LDR Land Disposal Restrictions  
mg/kg milligrams per kilogram

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#### 5.4 Semivolatile Organic Compounds

The oil in Tanks T-102 and T-103 shall be analyzed for select SVOCs, as determined by the treatment facility. Analysis of the oil will be performed by the LMES ASO laboratory. Although process knowledge indicates that SVOCs are not expected to be present in the waste near regulatory levels, the sludge in Tanks T-102 and T-103 shall be analyzed for total SVOCs to verify that the waste does not exhibit the characteristic of toxicity (EG&G 1994). The sludge will be analyzed by a RFETS laboratory. The RFETS analytical laboratory's standard semivolatile suite shall be used to analyze the samples. The base analytical method employed shall utilize E.P.A. SW-846 method 8270. Any deviations from the specified method(s) must be approved by the Analytical Projects Office. Results from this analysis will also be used to gain information for the treatment of the waste.

#### 5.5 Polychlorinated Biphenyls

The oil and sludge in Tank T-102 shall be analyzed for total PCBs. Verification samples of the oil will be analyzed by the LMES ASO laboratory. An additional oil sample from Tank T-102 will be analyzed for total PCB's by the RFETS laboratory. The sludge in both Tanks T-102 and T-103 shall be analyzed for total PCBs by the RFETS laboratory. Results from the analysis will be used to determine if the waste is regulated under TSCA (40 CFR Part 761). The results will also be used to determine if the waste is LDR and to gain information for the treatment of the waste. The required analytes are given in Table 5-5. If the total concentration of PCBs (sum of all 7 Aroclors) exceeds 50 ppm, the waste is TSCA regulated and is LDR.

Table 5-5 Polychlorinated Biphenyls

Constitu- ents	B a s e Method 1	CAS Number
Aroclor-1016	EPA - 8080	12674-11-2
Aroclor-1221	EPA - 8080	11104-28-2
Aroclor-1232	EPA - 8080	11141-16-5
Aroclor-1242	EPA - 8080	53469-21-9
Aroclor-1248	EPA - 8080	12672-29-6
Aroclor-1254	EPA - 8080	11097-69-1
Aroclor-1260	EPA - 8080	11096-82-5

Notes:

1. Testing Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, unless otherwise noted.

Acronyms: CAS Chemical Abstract Service

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## 5.6 Additional Treatment Parameters

In addition to the analyses listed above, the select additional analyses may be performed on the oil and sludge samples from Tanks T-102 and T-103 to obtain information for the treatment of the waste. The LMES ASO laboratory will be responsible for analyses on the oil matrix. The sludge matrix will be analyzed by the RFETS laboratory.

**Table 5-6 Additional Treatment Parameters**

Parameter	Base Method <sup>1</sup>
Flashpoint (°F)	EPA - 1010/1020
pH	EPA - 9040/9045
Boiling Point (°F)	ASTM D1120-89 OR EQUIV.
Freezing Point (°F)	ASTM D1177-88
Heat Content (BTU)	ASTM D240
Physical Description (include identification of layers)	Visual Inspection
Ash Content (Wt. %)	ASTM D482-80
Water Content (Wt. %)	ASTM D-1533-83 OR EQUIV.
Specific Gravity (@ 68 °F)	ASTM D-287
Chlorine	ASTM D-3761, EPA 300 series
Fluorine	ASTM D-3761, EPA 300 series
Corrosivity (mm/yr)	EPA - 1110
Viscosity (centipose)	ASTM D445, ASTM D2983

**Notes:**

1. Testing Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846 or American Society for Testing and Materials test methodology.

**Acronyms:**

BTU	British Thermal Unit
°F	degrees Fahrenheit
g/ml	grams per milliliter

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## 5.7 Analytical Methods

Laboratory requirements have been developed for waste constituents regulated by Colorado Hazardous Waste Regulations (CHWR). The WSRIC PD discusses the specific analytical methods to be used, estimated quantitation limits for organic compounds, estimated detection limits for inorganic analyses, field QA/QC criteria, and analytical control criteria. Guidance outlined in the WSRIC PD shall be adhered to by the analytical laboratories in analyzing samples for RCRA and TSCA constituents. These requirements are based on quality control standards outlined in EPA SW-846 for the methods that will be used to analyze this waste (EPA 1994). ASTM or industry standard methods shall be used for nonregulated analytes where applicable.

## 6.0 ANALYTICAL QUALITY CONTROL

Quality control requirements for RFETS laboratories supporting waste analysis are summarized in the WSRIC PD. These analytical control criteria shall be used to verify that analytical results for organic and inorganic analyses are of a documented precision and accuracy. The laboratories shall analyze calibration standards, interference check samples, blanks, duplicates, and matrix spikes to demonstrate the control criteria have been met. The WSRIC PD provides the type of quality control samples, the frequency at which they are analyzed, and the program criteria for the following analyses:

- Metals by inductively coupled plasma spectrometry and atomic absorption spectroscopy
- Volatile organic compounds by gas chromatography/mass spectroscopy
- Semivolatile organic compounds by gas chromatography/mass spectroscopy
- Polychlorinated Biphenyls by gas chromatography



## 7.0 REFERENCES

Code of Colorado Regulations, Title 6, Part 1007-3. *Rules and Regulations Pertaining to Hazardous Waste.*

Code of Federal Regulations, Title 40, Part 261. *Identification and Listing of Hazardous Waste.*

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